MicroVAX 3100 Model 40 and Model 80

Customer Technical Information

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This manual describes technical information about the MicroVAX 3100 Model 40 and Model 80 systems. It also gives a list of the console commands, and specifications for the system unit and internal SCSI devices.

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Preface

This manual describes technical information about the MicroVAX™ 3100 Model 40 and Model 80 systems. It also gives a list of the console commands, and specifications for the system unit and internal SCSI devices.

Audience

This manual is intended for experienced users, for example, system programmers or system managers.

Structure of This Manual

This manual is divided into four chapters and an index:

- Chapter 1 describes technical information about the Model 40 and the Model 80 systems.
- Chapter 2 describes the console security feature and how to set system defaults.
- Chapter 3 describes the console commands.
- Chapter 4 gives specifications for the system unit and for internal SCSI devices.

Additional Information

See the *MicroVAX 3100 Model 40 and Model 80 Operator Information* manual for the list of associated and related documents.

Conventions

The following conventions are used in this manual:

Convention	Description
MONOSPACE	Text displayed on the screen is shown in monospace type.
boldface type	Boldface type in examples indicates user input. Boldface type in text indicates the first instance of terms defined either in the text, in the glossary, or both.
italic type	Italic type emphasizes important information, indicates variables, and indicates complete titles of manuals.
nn nnn.nnn nn	A space character separates digits in numerals with 5 or more digits. For example, *10 000* equals *ten thousand*.
n.nn	A period in numerals signals the decimal point indicator. For example, *1.75* equals *one and three-fourths*.
UPPERCASE	Words in uppercase indicate a command.
lowercase	In format descriptions, words in lowercase indicate parameters or arguments to be specified by the user.
|	In command syntax descriptions, a vertical bar | separates similar options, one of which you can choose.
Note	A note contains information of special importance to the reader.
Ctrl/*x*	Ctrl/*x* indicates that you hold down the Ctrl key while you press another key or mouse button (indicated here by *x*).
x	A lowercase italic *x* indicates the generic use of a letter. For example, *xxx* indicates any combination of three alphabetic characters.
n	A lowercase italic *n* indicates the generic use of a number. For example, 19*nn* indicates a 4-digit number in which the last 2 digits are unknown.
{ }	In format descriptions, braces indicate required elements. You must choose one of the elements.
[ ]	In format descriptions, brackets indicate optional elements. You can choose none, one, or all of the options.

1

System Description

This chapter gives a technical description of the MicroVAX 3100 Model 40 and Model 80. Externally, both models are identical; internally, there are significant differences. This chapter includes information on the following:

- Model 40 system
- Model 80 system
- Internal mass storage devices
- Communications devices

1.1 Model 40 System

The Model 40 system uses the KA45 central processing unit (CPU) module. The KA45 CPU module is based on system on a chip (SOC) silicon technology. The KA45 CPU module contains the following components:

- DC222 (SOC) processor, which includes an internal floating point unit and cache memory
- The DC7201 S-chip, which is the primary interface between the CDAL bus and all memory, video, and input/output circuits
- 8M bytes of onboard random-access memory (RAM) with parity checking
- Support for up to 24M bytes of additional parity RAM
- 256K bytes of read-only memory (ROM), containing the boot and diagnostic firmware for the system
- 32K bytes of ROM, containing the boot and diagnostic firmware for the onboard options
- 32-byte network address ROM
- Time-of-year clock, which includes 50 bytes of nonvolatile RAM

- Three DEC423 asynchronous data-leads-only ports that use modified modular jack (MMJ) connectors
- One asynchronous modem control port (DB25 connector)
- IEEE 802.3 Ethernet controller for standard or ThinWire™ Ethernet
- SCSI controller
- Support for asynchronous communications options, which provide either 8 or 16 additional DEC423 ports, or 8 additional asynchronous modem control ports
- Support for a synchronous communications option, which provides two additional synchronous ports

1.1.1 Model 40 VAX Architecture Support

The KA45 CPU module in the Model 40 system supports the following VAX™ data types:

- byte, word, longword, quadword
- character string
- variable-length bit field
- f_floating point, d_floating point, and g_floating point

The operating system uses software emulation to support other VAX data types.

The KA45 CPU module supports the following VAX instructions:

- integer and logical
- address
- variable-length bit field
- control
- procedure call
- miscellaneous
- queue
- character string instructions:
- CMPC3/CMPC5
- LOCC
- MOVC3/MOVC5
- SCANC
- SKPC
- SPANC
- Operating system support
- f_floating point, d_floating point, and g_floating point

The operating system uses software emulation to support other VAX instructions.

1.2 Model 80 System

The Model 80 system uses the KA47 CPU module. The KA47 CPU module is the primary component in the Model 80 system. The KA47 CPU module contains the following components:

- DC595 processor chip
- DC598 clock chip
- DC596 floating point accelerator chip
- The DC7201 S-chip, which is the primary interface between the CDAL bus and all memory, video, and input/output circuits
- 256K bytes of second level write-through cache memory
- Gate arrays DC7201 and DC7203
- Basic system memory (8M bytes of RAM consisting of two MS44-AA memory modules)
- Support for up to 72M bytes of RAM
- 256K bytes of ROM (boot and diagnostic firmware for the system)
- 32-byte network address ROM
- Time-of-year clock, which includes 50 bytes of nonvolatile RAM
- Three DEC423 synchronous data-only ports (MMJ connectors)
- One asynchronous modem control port (DB25 connector)
- Ethernet controller for standard or ThinWire Ethernet
- SCSI controller
- Support for optional asynchronous communications devices, which provide either 8 or 16 additional DEC423 ports, or 8 additional asynchronous modem control ports
- Support for optional synchronous communications devices, which provide two additional synchronous ports

1.2.1 Model 80 VAX Architecture Support

The KA47 CPU module supports the following VAX data types:

- byte, word, longword, quadword
- character string
- variable-length bit field
- absolute queues
- self-relative queues
- f_floating point, d_floating point, and g_floating point

The operating system uses software emulation to support other VAX data types.

The KA47 CPU module supports the following VAX instructions:

- integer, arithmetic and logical
- address
- variable-length bit field
- control
- procedure call
- miscellaneous
- queue
- character string instructions:
- MOVC3/MOVC5
- CMPC3/CMPC5
- LOCC
- SCANC
- SKPC
- SPANC
- Operating system support
- f_floating point, d_floating point, and g_floating point

The DC595 processor chip provides special microcode assistance to aid the macrocode emulation of the following instruction groups:

- Character string (other than those mentioned previously)
- Decimal string
- CRC
- EDITPC

The operating system uses software emulation to support other VAX instructions.

1.3 Internal Mass Storage Devices

Table 1–1 shows the internal mass storage devices that are supported by the Model 40 and the Model 80 systems.

Table 1–1 Supported Internal Mass Storage Devices

Device	Size (inches)	Capacity (bytes)	Description
RZ23L	3.5	121M	Hard disk drive
RZ24	3.5	209M	Hard disk drive
RZ25	3.5	426M	Hard disk drive
TZ30	5.25	95M	Tape drive
TZK10	5.25	320M or 525M	Tape drive
RX™26	3.5	1.44M or 2.88M	Diskette drive
RRD42	5.25	600M	CDROM drive

Both systems support a maximum of five internal SCSI devices, only two of which can be removable media devices. In both systems, an RZ-series disk contains factory installed software (FIS). Chapter 4 gives the specifications for each internal SCSI device.

1.4 Communications Devices

The Model 40 and Model 80 systems support asynchronous and synchronous communications devices.

1.4.1 Asynchronous Communications Devices

Table 1–2 lists the asynchronous devices supported by Model 40 and Model 80 systems.

Table 1–2 Supported Asynchronous Devices

Device	Description
DHW42-AA	Eight-line DEC423 asynchronous option
DHW42-BA	Sixteen-line DEC423 asynchronous option
DHW42-CA	Eight-line EIA-232 modem asynchronous option
DHW42-UP	Eight-line to 16-line upgrade of the DEC423 asynchronous option

1.4.2 Synchronous Communications Devices

Table 1–3 lists the synchronous devices supported by the Model 40 and Model 80 systems.

Table 1–3 Supported Synchronous Devices

Device	Description
DSW42-AA	Two-line EIA-232/V.24 synchronous module

If you order a different synchronous option cable, you can use different interface standards with the synchronous communications module. Table 1–4 lists each standard and the part number of the corresponding option cable.

Table 1–4 Synchronous Communications Option Cable Part Numbers

Standard	Option Cable Part Number
EIA-232/V.24	BC19D-02
EIA-423/V.10	BC19E-02
EIA-422/V.11	BC19B-02

2

Console Security Feature and System Defaults

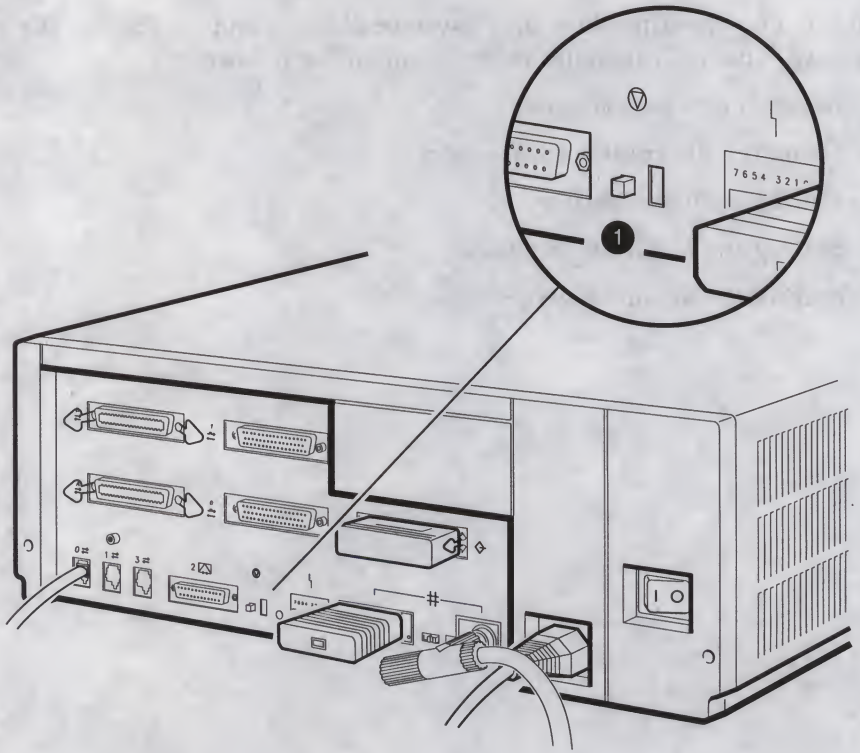
This chapter describes how to set system defaults and how to use the console security feature. It includes information on the following:

- Returning to console mode
- Using the alternative console port
- Console security feature
- Setting the default boot device
- Setting the default recovery action

2.1 Returning to Console Mode

To use the procedures described in this chapter, the system must be in console mode. Before returning to console mode, you must shut down the operating system software if it is running. See the operating system documentation for information on the shutdown procedures. To return to console mode, follow these steps:

1. Shut down the operating system software if it is running.
2. Press the halt button on the back of the system unit. The system responds with the console prompt (>>>) when it is in console mode.



RE_EN06325A_91

❶ Halt Button

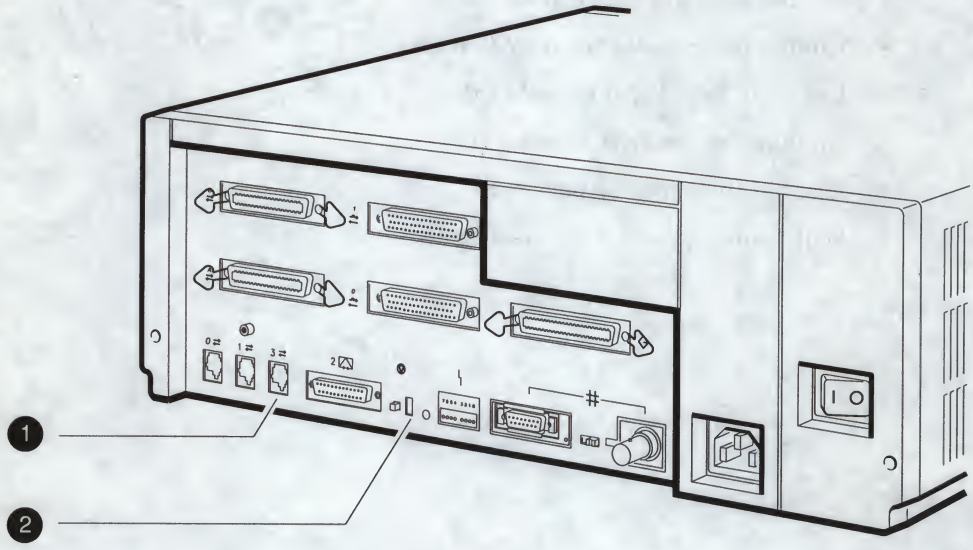
2.2 Using the Alternative Console Port

The MicroVAX 3100 systems provide an alternative console port through MMJ port 3. You can use this alternative console port in the same way as you would use the standard console port, MMJ port 0. However, the alternative console port allows you to halt the system by pressing the break key on the keyboard, a feature that is not available when you use the standard console port. To enable the alternative console port, follow these steps:

1. Set the on/off switch on the system unit to the off (O) position.
2. Connect a terminal to MMJ port 3.
3. Set the break/enable switch to the up position.

   The break enable LED lights when you set the switch to the up position.
4. Set the on/off switch on the system unit to the on (|) position.

   The system recognizes the position of the switch only when you set the power switch to the on (|) position.



❶ MMJ Port 3

❷ Break/Enable Switch

2.3 Console Security Feature

The console security feature allows you to disable most of the system console commands. When the security password is set, there are two types of users: privileged users and unprivileged users. Privileged users know the security password and can use the full range of console commands; unprivileged users can use only the following commands:

- LOGIN—Use this command with the security password to become a privileged user.
- BOOT—Use this command without parameters to boot the operating system.
- CONTINUE—Use this command to return to the operating system after pressing the halt button.

Chapter 3 describes the console commands.

The following subsections describe how to do the following:

- Set the security password
- Enable the console security feature
- Log in to privileged console mode
- Change the security password
- Disable the security password
- Exit from privileged console mode

2.3.1 Setting the Security Password

The console security feature is disabled when you receive the system. To set the security password on the system, follow these steps:

1. Enter the following command at the console prompt (>>>):

   ```
   >>> SET PSWD
   ```

   The system responds with the following prompt:

   ```
   PSWD1 >>>
   ```

   Note

   - The security password must be a string of exactly 16 hexadecimal characters (0 to 9 and A to F).
   - Write down the security password and store it in a safe place. If you forget the security password, you must call your Digital Services representative to disable the console security feature.

2. Enter a security password and press Return.

   The system does not display the security password as you type it. The system responds with the following prompt:

   ```
   PSWD2 >>>
   ```

3. Verify the security password by entering it a second time.

   The system does not display the security password as you type it. If you enter the same security password at each prompt, the system saves the security password in nonvolatile memory. The system does not lose the security password when you turn off the system.

   If the second security password does not match the first, the system responds with the following error message:

   ```
   ?34 ILL PSWD
   >>>
   ```

4. Repeat steps 1 to 3 if you see an error message.

2.3.2 Enabling the Console Security Feature

When you have set the security password, you must enable the console security feature. To enable the console security feature, enter the following command at the console prompt:

```
>>> SET PSE 1
```

The system responds with the following display when you have enabled the console security feature:

```
PSE = 00000001
```

2.3.3 Logging in to Privileged Console Mode

When the console security feature is enabled, you must enter the security password to log in to privileged console mode. In privileged console mode you can use the full range of console commands. To log in to privileged console mode, follow these steps:

Note

You must set the security password before following these steps (see Section 2.3.1).

1. Enter the following command:

   ```
   >>> LOGIN
   ```

   The system responds with the following prompt:

   ```
   PSWD0 >>>
   ```

2. Enter the security password and press Return.

   The system does not display the security password as you type it. If you enter the correct security password, the system returns you to the console prompt and you become a privileged user. You can now use the full range of console commands.

   If you enter an incorrect security password, the system responds with the following error message:

   ```
   ?34 ILL PSWD
   >>>
   ```

3. Repeat steps 1 and 2 if an error message is displayed.

2.3.4 Changing the Security Password

You must be a privileged user to change the security password. To change the security password, follow these steps:

1. Follow the procedure in Section 2.3.3 using the current security password to log in to the system.
2. Enter the following command:

   ```
   >>> SET PSWD
   ```

   The system responds with the following prompt:

   ```
   PSWD0 >>>
   ```

3. Enter the current security password and press Return.

   The system does not display the security password as you type it. The system responds with the following prompt:

   ```
   PSWD1 >>>
   ```

4. Enter a new security password and press Return.

   The system does not display the security password as you type it. The system then responds with the following prompt:

   ```
   PSWD2 >>>
   ```

5. Verify the new security password by entering it a second time.

   The system does not display the security password as you type it. If you enter the correct, current security password at the PSWD0 >>> prompt, and correctly enter the new security password a second time, the system saves the new security password in nonvolatile memory. The system does not lose the new security password when you turn off the system.

   If you incorrectly enter the current password or incorrectly enter the new security password a second time, the system responds with the following error message:

   ```
   ?34 ILL PSWD
   >>>
   ```

6. Repeat steps 1 to 5 if an error message is displayed.

2.3.5 Disabling the Console Security Feature

When you disable the console security feature, all users can use the full range of console commands. To disable the console security feature, follow these steps:

1. Follow the procedure in Section 2.3.3 using the current security password to log in to the system.
2. Enter the following command:

```
>>> SET PSE 0
```

The system responds with the following display when you have disabled the console security feature:

```
PSE = 00000000
```

2.3.6 Exiting from Privileged Console Mode

When you exit from privileged console mode, privileged users must enter the LOGIN command with the correct password before they can use the full range of console commands. To exit from privileged console mode, enter one of the following commands:

- BOOT (with any supplied parameters)
- CONTINUE
- HALT
- START

Chapter 3 describes each of these commands.

2.4 Setting the Default Boot Device

When the system is shipped, it is set to boot from the system disk, DKA300. This RZ-series disk holds the factory installed software (FIS).

You can set the system to boot from a different default boot device that holds the operating system software. Table 2–1 shows the alternative default boot devices and their associated VMS™ device names.

Table 2–1 Alternative Default Boot Devices

Device	VMS Device Name
Hard disk (SCSI ID 0 to 7)	DKA*x*00[1]
Network (the system boots from a remote system)	ESA0
Tape drive (SCSI ID 0 to 7)	MKA*x*00[1]
Compact disc (SCSI ID 0 to 7)	DKA*x*00[1]

[1] *x* represents the SCSI ID of that device.

To set an alternative default boot device, enter the SET BOOT command using the VMS device name of the alternative default boot device. For example, to set the system to boot over the network, enter the following command:

```
>>> SET BOOT ESA0
```

The system responds with the following display when you have set ESA0 as the default boot device:

```
BOOT = ESA0
```

2.5 Setting the Default Recovery Action

There are three default recovery actions. You can change the default recovery action by entering the SET HALT command and the value associated with the action you want to set. Table 2–2 shows the three default recovery actions and their associated values. When the system is shipped, the default recovery action is set to halt.

Table 2–2 Default Recovery Actions and Associated Values

Recovery Action	Associated Value	Result
Restart	1	The system tries to restart the operating system. If it fails to restart the operating system, it tries to boot. If the system fails to boot, it halts.
Boot	2	The system tries to boot. If it fails to boot, it halts.
Halt	3	The system halts and displays the console prompt.

To set an alternative default recovery action, enter the SET HALT command using the value associated with the recovery action you want to set. For example, to set the system to halt, enter the following command:

```
>>> SET HALT 3
```

The system responds with the following display when you have set the default recovery action to 3.

```
HALT = 00000003
```

3

Console Commands

This chapter describes the console commands that you can enter when the system is in console mode. The system displays the console prompt (>>>) when it is in console mode. If the system is running the operating system software, see Chapter 2 for information on returning the system to console mode.

If the console security feature is enabled and a security password is set, you must log in to privileged console mode before using most of these commands. See Chapter 2 for information on the console security feature.

The following sections describe all the console commands, give the command format, and describe the significance of each parameter.

3.1 BOOT

Passes control to the virtual machine bootstrap (VMB) program, which resides on the system ROM. The format of this command is as follows:

B[OOT] [/[R5:]<bflg>] <ddau>[:]]

where:

- *R5:* represents a register, through which the hexadecimal value represented by <bflg> is passed to the VMB.
- *<bflg>* is the boot flag value.
- *<ddau>* is the name of the boot device. It passes to the VMB in register R0.

  The Ethernet network boot device name is ESA0; SCSI boot device names have the following format:

  ddcull

  where:

  - *dd* is the device mnemonic
  - *c* is the controller destination (always A)

- *u* is the SCSI ID value of the boot device
- *ll* is the logical unit number

The console program accepts device names in lowercase characters, but it is recommended that you use uppercase characters. You can specify more than one boot device, and you can type a colon at the end of the device names as shown in the command format. You can specify up to two devices on the command line. You must separate device names by typing either a space or a comma.

If the nonvolatile RAM (NVR) contains a default boot device name, the console program passes the descriptor for this device to the VMB. The VMB then boots the system from the specified device.

If you do not specify a device name or qualifiers or both in the command, the system attempts to boot from the default boot device specified in the NVR. If the default boot device is not defined ({NULL}), the console program passes a descriptor for device ESA0 to the VMB program. This triggers the VMB program to boot the system over the network.

3.2 CONTINUE

Allows you to exit from console mode and enter (or reenter) program mode (the operating system). The format of this command is as follows:

C[ONTINUE]

The address to which control passes is one of the following:

- The address stored in the program counter when the system went into console mode
- The address that the user specifies using the DEPOSIT command

3.3 DEPOSIT

Transfers the specified data to the specified address. The format of this command is as follows:

D[EPOSIT] [{/B | /W | /L | /Q | /A}] [{/P | /V | /I}] [/G] [/U] [/N:<n>] [{<addr> | <sym> | + | - | * | @} [<datum>]]

where:

- */B /W /L /Q /A /P /V /I /G /U /N:<n>* are deposit command qualifiers (see Table 3–1).

If you do not specify a size or address qualifier, the console program uses the size and address qualifier of the previous memory-specific command. If you specify conflicting qualifiers, the console program ignores the command and generates an error message. The effects of the miscellaneous qualifiers are not valid outside the command in which they are specified.

Note

The /U (unprotect) qualifier allows access to almost any address. If you do not use the /U qualifier, you can access address locations in the range 2000.0000 to 3FFF.FFFF (excluding the TOY clock). The /U qualifier is intended for use only by firmware developers.

- <*addr*> is the hexadecimal address into which you want to deposit the data.
- <*sym*> is a mnemonic that represents the address into which you want to deposit data (see Table 3–2).
- + - * @ are operators that you can use for relative memory addressing (see Table 3–3).
- <*datum*> is the value you want to deposit in the address location you specify.

Table 3–1 DEPOSIT Command Qualifiers

	Qualifier Type	
Size	**Address**	**Miscellaneous**
/B (byte)	/V (virtual memory)	/N:<n> (repeat count)
/W (word)	/P (physical memory)	/U (unprotect)
/L (longword)	/I (internal register)	
/Q (quadword)	/G (general purpose register)	
/A (ASCII)		

Table 3–2 Memory Address Mnemonics

Mnemonic	IPR Number	Type[1]	Description
KSP	0	RW	Kernel stack pointer
ESP	1	RW	Executive stack pointer
SSP	2	RW	Supervisor stack pointer
USP	3	RW	User stack pointer
ISP	4	RW	Interrupt stack pointer
P0BR	8	RW	P0 base register
P0LR	9	RW	P0 length register
P1BR	10	RW	P1 base register
P1LR	11	RW	P1 length register
SBR	12	RW	System base register
SLR	13	RW	System length register
PCBB	16	RW	Process control block base
SCBB	17	RW	System control block base
IPL	18	RW	Interrupt priority level
ASTLVL	19	RW	AST level
SIRR	20	W	Software interrupt request
SISR	21	RW	Software interrupt summary
ICCS	24	RW	Interval clock control
NICR	25	W	Next interval count (not implemented)
ICR	26	R	Interval count (not implemented)
TODR	27	RW	Time of year (not implemented)
CCR	37	RW	Cache control
MSER	39	RW	Memory system error register
SAVPC	42	R	Console saved PC
SAVPSL	43	R	Console saved PSL
MAPEN	56	RW	Memory management enable
TBIA	57	W	Translation buffer invalidate all
TBIS	58	W	Translation buffer invalidate single

[1]R indicates read; W indicates write.

(continued on next page)

Table 3–2 (Cont.) Memory Address Mnemonics

Mnemonic	IPR Number	Type[1]	Description
SID	62	R	System identification
TBCHK	63	W	Translation buffer check
	64 to 127		Reserved

[1]R indicates read; W indicates write.

Table 3–3 Memory Addressing Mnemonics

Symbol	Addressing Method Description
*	The memory address specified by the most recent DEPOSIT or EXAMINE command.
+	The memory address immediately following the address specified by the most recent DEPOSIT or EXAMINE command. For physical or virtual memory address, the address specified is the address of the most recent DEPOSIT or EXAMINE command plus the size that the most recently specified size qualifier indicates (1 for byte, 2 for word, 4 for longword.)
-	The memory address immediately before the address specified by the most recent DEPOSIT or EXAMINE command. For physical or virtual memory address, the address specified is the address of the most recent DEPOSIT or EXAMINE command minus the size that the most recently specified size qualifier indicates (1 for byte, 2 for word, 4 for longword).
@	Indirect addressing. The format is @<address>, where <address> is a hexadecimal address used as a pointer to another address. If you do not specify an address, the address that the command uses is the address used by the most recent memory referencing command.

Table 3–4 shows some examples of memory addressing.

Table 3–4 Examples of Memory Addressing

Example	Description
DEPOSIT R0 200	Stores the value 200 in the register R0.
DEPOSIT/P @R0 200	Stores the value 200 in the address pointed to by the register R0. The /P qualifier specifies that the value in the R0 register is a physical address reference.
DEPOSIT/V @R0 200	Stores the value 200 in the address pointed to by the register R0. The /V qualifier specifies that the value in the R0 register is a virtual address reference.
DEPOSIT @ 200	Stores the value 200 in the address specified by the most recent memory referencing command.

3.4 EXAMINE

Displays, in hexadecimal format, the contents of the specified address. The format of this command is as follows:

E[XAMINE] [{/B | /W | /L | /Q | /A}] [{/P | /V | /I}] [/G] [/U] [/N:<n>] [{<addr> | <sym> | + | - | * | @} [<datum>]]

where:

- */B /W /L /Q /A /P /V /I /G /U /N:<n>* are qualifiers. The EXAMINE command uses the same set of qualifiers as the DEPOSIT command (see Table 3–1).
- *<addr>* is the hexadecimal address into which you want to deposit the data.
- *<sym>* is a mnemonic that represents the address that you want to examine. The EXAMINE command uses the same mnemonics as the DEPOSIT command (see Table 3–2).
- + - * @ are operators that you can use for relative memory addressing. The EXAMINE command uses the same operators for memory addressing as the DEPOSIT command (see Table 3–3).
- *<datum>* is the value you want to deposit in the address location you specify.

3.5 FIND

Forces the console program to search the main RAM memory (starting at physical address zero) for the following:

- A page-aligned 128K-byte segment of main memory
- A restart parameter block (RPB)

If the console program finds a 128K-byte memory segment or an RPB, the console program places the starting address of the segment or RPB, plus 512, in the stack pointer (SP) register. If the console program does not find a memory segment or RPB, the console program issues an error message. The format of this command is as follows:

F[IND][/MEMORY | /RPB

where:

- */MEMORY* is a qualifier that specifies a search for a 128K-byte, page-aligned segment of memory.
- */RPB* is a qualifier that specifies a search for an RPB.

The FIND command searches for an RPB if you do not enter a qualifier.

3.6 HALT

Displays a halt message followed by the console prompt. The format of this command is as follows:

H[ALT]

3.7 HELP

Displays a list of the console commands that the system supports. The format of this command is as follows:

HE[LP] or **?**

Figure 3–1 shows the help display.

Figure 3–1 Help Display

```
BOOT [/[R5:]<bflg>] <ddau>[:]]
CONTINUE
DEPOSIT [{/B|/W|/L|/Q|/A}] [{/P|/V|/I}] [/G] [/U] [/N:<n>]
    [{<addr>|<sym>|+|-|*|@} [<datum>]]
EXAMINE [{/B|/W|/L|/Q|/A}] [{/P|/V|/I}] [/G] [/U] [/N:<n>]
    [{<addr>|<sym>|+|-|*|@}]
FIND [{/MEMORY|/RPB}]
HALT
HELP
INITIALIZE
LOGIN
REPEAT <cmd>
SET BOOT <ddau>
SET BFLG <bflg>
SET DIAGENV <1-3>
SET FBOOT <0-1>
SET HALT <1-3>
SET KBD <0-15>
SET MOP <0-1>
SET PSE <0-1>
SET PSWD
SET SCSI <0-7>
SET TRIG <0-1>
SHOW { BOOT|BFLG|CONFIG|DEV|DIAGENV|FBOOT|ETHER|ERROR|
       ESTAT|HALT|KBD|MEM|MOP|PSE|SCSI|TRIG}
START <addr>
TEST [/UTIL] <devnam|devnbr>
UNJAM
X <addr> <cnt> ...
?
```

3.8 INITIALIZE

Performs a processor initialization sequence. The format of this command is as follows:

I[NITIALIZE]

Table 3–5 gives the values of the registers that the processor initialization sequence sets.

Table 3–5 Initial Values of Processor Registers

Register	Value
PSL	041F.0000
ASTLVL	4
SISR	0
ICCS	0
MAPEN	0

The processor initialization sequence also sets registers R0 to R13 to 0, the interrupt stack pointer (ISP) to 200, and the program counter (PC) to 200.

3.9 LOGIN

Allows you to put the system in privileged console mode. When the console security feature is enabled (see Section 3.11.8) and when you put the system in console mode, the system operates in unprivileged console mode. You can access only a subset of the console commands. To access the full range of console commands, you must use this command. The format of this command is as follows:

LO[gin]

When you enter the command, the system prompts you for a password as follows:

```
PSWD0 >>
```

You must enter the current console security password. If you do not enter the correct password, the system displays the error message, ILL PSWD. When you enter the console security password, the system operates in privileged console mode. In this mode, you can use all the console commands. The system exits from privileged console mode when you enter one of the following console commands:

- BOOT
- CONTINUE
- HALT
- START

3.10 REPEAT

Allows you to specify a command that you want to repeat continuously. The format of this command is as follows:

R[EPEAT] <cmd>

where:

- *<cmd>* is the command that you want to repeat. You can repeat only the following commands:
  - DEPOSIT
  - EXAMINE
  - TEST

To stop a REPEAT command, press Ctrl/C.

3.11 SET

Sets the console NVR parameter to the specified value. The format of this command is as follows:

SE[T]<parameter-name><value>[<value>]

The following subsections describe the SET commands.

3.11.1 SET BFLG

Sets the default boot flags. The format of this command is as follows:

SE[T] BF[LG] <bflg>

where:

- *<bflg>* is a hexadecimal number up to eight characters long. The boot flag is placed in register R5. The console program does not check the validity of the hexadecimal number you enter. Table 3–6 shows the valid boot flags for VMS systems.

Table 3–6 Boot Flags Used by VMS

Flag	Definition
00000001	RPB$V_CONV—Conversational boot. At various points in the system boot procedure, the bootstrap code requests parameters and other input from the console terminal. If the DIAG is also on, the diagnostic supervisor then goes into MENU mode and prompts the user for devices to test.
00000002	RPB$V_DEBUG—Debug. If this flag is set, VMS maps the code for the XDELTA debugger into the system page tables of the operating system.
00000004	RPB$V_INIBPT—Initial breakpoint. If RPB$V_DEBUG is set, VMS executes a BPT instruction immediately after enabling mapping.
00000008	RPB$V_BBLOCK—This skips the files-11 boot and performs only the boot block type boot.
00000010	RPB$V_DIAG—Diagnostic boot. The secondary bootstrap is an image called [SYSMAINT]DIAGBOOT.EXE.
00000020	RPB$V_BOOBPT—Bootstrap breakpoint. Stops the primary and secondary bootstraps with a breakpoint instruction before testing the memory.
00000040	RPB$V_HEADER—Image header. Takes the transfer address of the secondary bootstrap image from that file's image header. If RPB$V_HEADER is not set, transfers control to the first byte of the secondary boot file.
00000080	RPB$V_NOTEST—Memory test inhibit. Sets a bit in the PFN bit map for each page of memory present. Does not test the memory.
00000100	RPB$V_SOLICT—File name. Prompts for the name of a secondary bootstrap file.
00000200	RPB$V_HALT—Halt before transfer. Executes a halt instruction before transferring control to the secondary bootstrap.
00000400	RPB$V_NOPFND—No PFN deletion (not implemented); intended to inform the VMB not to read a file from the boot device that identifies bad or reserved memory pages, so that the VMB does not mark these pages as valid in the PFN bitmap.
00000800	RPB$V_MPM—Specifies that multiport memory is to be used for the total executive memory requirement. No local memory is to be used. This is for tightly-coupled multiprocessing. If the DIAG is also on, then the diagnostic supervisor goes into AUTOTEST mode.

(continued on next page)

Table 3–6 (Cont.) Boot Flags Used by VMS

Flag	Definition
00001000	RPB$V_PFILE (overlays RPB$V_USEMPM)—File name. Prompts for the name of the parameters file on a network bootstrap operation.
00002000	RPB$V_MEMTEST—Specifies that a more extensive algorithm must be used when testing main memory for hardware nonrecoverable (RDS) errors.
00004000	RPB$V_FINDTEST—Requests use of MA780 memory if the MS780 is insufficient for booting. Used for 11/782 installations.
00008000	RPB$V_AUTOTEST—Used by diagnostic supervisor.
00010000	RPB$V_CRDTEST—Requests pages with CRD errors to be removed from the bitmap.
X0000000	RPB$V_TOPSYS—The X position specifies the top-level directory number for system disks with multiple systems.

3.11.2 SET BOOT

Sets the default boot device. The format of this command is as follows:

SE[T] BO[OT] <ddau>

- *<ddau>* is the boot device name. This parameter must be a valid boot device name that the BOOT command accepts (see Section 3.1).

When you enter a period (.) as a value, the console program resets the boot device. If you enter the SHOW BOOT command, the system responds with the following display:

```
BOOT = {NULL}
```

If you enter a BOOT command when the default boot device is reset, the system attempts to boot from the network (boot device ESA0).

3.11.3 SET DIAGENV

Sets the diagnostic environment. The format of this command is as follows:

SE[T] DI[AGENV] <1-3>

where:

- *<1-3>* represents a number in the range 1 to 3 that you enter to set the diagnostic environment (see Table 3–7).

Table 3–7 Diagnostic Environment Values

<1-3>	Description
1	Customer environment. This is the default test environment.
2 and 3	Reserved for Digital use only.

3.11.4 SET FBOOT

Sets the diagnostic startup mode. The format of this command is as follows:

SE[T] F[BOOT] <0-1>

The parameter <0-1> is a number in the range 0 to 1 that determines the type of diagnostic startup (see Table 3–8).

Table 3–8 FBOOT Values

<0-1>	Description
0	Normal diagnostic startup tests
1	Fast diagnostic startup tests

Note

Minimal diagnostic testing is performed during a fast diagnostic startup operation.

3.11.5 SET HALT

Sets the default recovery action, that is, the action that the console program takes when you turn on the system or following an error. The format of this command is as follows:

SE[T] H[ALT] <1-3>

where:

- *<1-3>* represents a number in the range 1 to 3 that you enter to set the default halt action (see Table 3–9).

Table 3–9 Halt Action Values

Value	Halt Action	Description
1	Restart	The system tries to restart the operating system. If it fails to restart the operating system, it tries to boot. If the system fails to boot, it halts.
2	Boot	The system tries to boot. If it fails to boot, it halts.
3	Halt	The system halts and displays the console prompt. This is the default value.

3.11.6 SET KBD

This command is not applicable to MicroVAX 3100 systems.

3.11.7 SET MOP

Enables or disables the network listener. The format of this command is as follows:

SE[T] MO[P] <0-1>

where:

- *<0-1>* represents a number in the range 0 to 1 that you enter to set the network listener condition (see Table 3–10).

Table 3–10 Network Listener Values

Value	Description
0	Disabled
1	Enabled (default)

Note

For remote triggering and remote console connection, you must set the MOP and TRIG values to 1, console security must be enabled (PSE = 1), and you must have a valid password set up.

3.11.8 SET PSE

Allows you to enable or disable the console security feature of the system. The format of this command is as follows:

SE[T] PSE <0-1>

where:

- *<0-1>* represents a number in the range 0 to 1 that you enter to enable or disable the console security feature (see Table 3–11).

Table 3–11 Console Security Feature Values

Value	Description
0	Disabled
1	Enabled

Note

For remote triggering and remote console connection, you must set the MOP and TRIG values to 1, console security must be enabled (PSE = 1), and you must have a valid password set up.

When the console security feature is enabled, only a subset of the console commands are available to the user. These commands are listed in Section 2.3. To enable the complete set of console commands once the console security feature is enabled, you must use the LOGIN command (see Section 3.9).

3.11.9 SET PSWD

Allows you to set or change the console security password. The console security password is used for:

- Remote trigger verification—When the password is set, the network listener must verify the password before processing a remote trigger request to boot the system.
- Putting the system in privileged console mode—When the password is set, you must use the LOGIN command and enter the correct password to access the full range of console commands.

Note

For remote triggering and remote console connection, you must set the MOP and TRIG values to 1, console security must be enabled (PSE = 1), and you must have a valid password set up.

The format of this command is as follows:

SE[T] PSW[D]

When you are entering the console security password for the first time, the system prompts you for the password, then asks you for confirmation of the password as follows:

```
PSWD1 >>>
PSWD2 >>>
```

The password you enter must be exactly sixteen hexadecimal characters.

Note

The password is not displayed on the screen.

When you want to change the console security password, you must put the system in privileged console mode, using the LOGIN command (see Section 3.9).

When the system is in privileged console mode, you can use the SET PSWD command to change the password. The system prompts you for the current password, a new password, and confirmation of the new password as follows:

```
PSWD0 >>>
PSWD1 >>>
PSWD2 >>>
```

Note

If you forget the password, you must contact your Digital Services representative.

3.11.10 SET RADIX

Sets the default input radix. The format of this command is as follows:

SE[T] R[ADIX] <value>

The parameter <value> determines the radix type (see Table 3–12).

Table 3–12 Radix Values

Value	Description
0	Default RADIX for the associated command
10	Decimal
16	Hexadecimal

Note

You can use the introducers %X and %D on the command line at any time to change the default radix. These introducers inform the console program that the next value is of the radix that the introducer specifies. %X specifies hexadecimal; %D specifies decimal.

3.11.11 SET SCSI

Sets the SCSI ID of the SCSI controller. The format of this command is as follows:

SE[T] S[CSI] <0-7>

where:

- *<0-7>* is a number in the range 0 to 7, that is, the ID you want to assign to the SCSI controller. The SCSI ID of the SCSI controller is set to 6 before the system is shipped.

3.11.12 SET TRIG

Enables or disables the remote trigger utility. When the remote trigger utility is enabled, a remote system can force the local system to boot from the local system's default boot device. The format of this command is as follows:

SE[T] T[RIG] <0-1>

where:

- *<0-1>* is a number in the range 0 to 1 that determines the remote trigger condition (see Table 3–13).

Table 3–13 Remote Trigger Values

Value	Description
0	Disabled
1	Enabled

Note

For remote triggering and remote console connection, you must set the MOP and TRIG values to 1, console security must be enabled (PSE = 1), and you must have a valid password set up.

3.12 SHOW

Displays the value of the console NVR parameter you specify. The format of this command is as follows:

SH[OW]<parameter-name>

where:

- *<parameter-name>* is the NVR parameter that you want to view. See the following subsections for more information.

3.12.1 SHOW BFLG

Displays the default boot flags. The format of this command is as follows:

SH[OW] BF[LG]

The following is an example of the display that this command produces when no default boot flags are set:

```
BFLG = 00000000
```

3.12.2 SHOW BOOT

Displays the default boot device. The format of this command is as follows:

SH[OW] BO[OT]

The following is an example of the display that this command produces:

```
BOOT = DKA200
```

3.12.3 SHOW CONFIG

Displays the system configuration. The format of this command is as follows:

SH[OW] CONF[IG]

The command displays information about devices that the firmware has tested. It also displays the device errors that the most recent device test detected. Figure 3–2 is an example of the display that the SHOW CONFIG command produces.

Figure 3–2 SHOW CONFIG Display

```
KA45-A V1.0
08-00-2B-16-44-48
8MB
DEVNBR  DEVNAM    INFO
------  --------- ------------------------------------
1          NVR    OK
3           DZ    OK
4        CACHE    OK
5          MEM    OK      ❶       ❷       ❸       ❹
                  8MB = SY=8MB, S0/1=0MB, S2/3=0MB, S4/5=0MB
6          FPU    OK
7           IT    OK
8          SYS    OK
9           NI    OK
10        SCSI    OK
                  3-RZ23L  6-INITR
12        COMM    OK
                  DSW41/42 1 CHANNEL V3.11-47
14       ASYNC    DHW41/2         V1.5
```

❶ Basic CPU Module Memory

❷ Memory Expansion Increment 1 (Connectors 1H and 1L)

❸ Memory Expansion Increment 2 (Connectors 2H and 2L)

❹ Memory Expansion Increment 3 (Connectors 3H and 3L)

3.12.4 SHOW DEVICE

Displays the current status of the Ethernet and SCSI devices in the system. The format of this command is as follows:

SH[OW] DE[VICE]

The display includes the Ethernet address and information about the SCSI devices connected to the SCSI bus. Figure 3–3 is an example of the display that the SHOW DEVICE command produces.

Figure 3–3 SHOW DEVICE Display

```
❶          ❷          ❸          ❹          ❺     ❻          ❼      ❽
VMS/VMB    ADDR    DEVTYPE    NUMBYTES    RX/FX   WP    DEVNAM    REV
-------    ----    -------    --------    -----   --    ------    --
ESA0       08-00-2B-16-44-48
DKA300     A/3/0   DISK       ......      FX              RZ23L   1F25
..HostID.. A/6 INITR
```

❶ VMS/VMB Device Name

❷ Ethernet or SCSI Address of the Device

❸ Device Type— For example, disk drive (DISK) or tape drive (TAPE)

❹ Number of Megabytes

❺ Media Type—Removable (RX) or fixed (FX)

❻ Write Protected

❼ Option Name

❽ Revision Number

3.12.5 SHOW DIAGENV

Displays the current diagnostic environment. The format of this command is as follows:

SH[OW] DI[AGENV]

Table 3–7 gives the values and the meaning of each value. The following is an example of the display that this command produces:

```
DIAGENV = 1
```

3.12.6 SHOW ERROR

Displays the errors that the most recent self-test or system exerciser test detected. The format of this command is as follows:

SH[OW] ER[ROR]

Figure 3–4 is an example of the display that the SHOW ERROR command produces for a system exerciser test.

Figure 3–4 SHOW ERROR Display

```
❶ ❷   ❸    ❹     ❺
?  000   1    NVR  0003
?? 130  10   SCSI  0018
130 000E 00000003 00120012 00180000 FFFF001B 00000000 00000000 FFFFFFFF❻
```

❶ A question mark (?) indicates a soft error, that is, an error that you do not have to correct before you boot the system. Two question marks (??) indicate a hard error, that is, an error that you must correct before you boot the system.

❷ The FRU number of the failing device.

❸ The Device Number.

❹ The Device Mnemonic.

❺ A Device Specific Error Code.

❻ Additional error information about the preceding error.

3.12.7 SHOW ESTAT

Displays a set of summary screens associated with the most recent system exerciser test. The format of this command is as follows:

SH[OW] ES[TAT]

If the system exerciser test hangs or halts, you can use this command to determine the status of the system before it hangs or halts.

3.12.8 SHOW ETHERNET

Displays the hardware Ethernet address. The format of this command is as follows:

SH[OW] ET[HERNET]

The following is an example of the display that this command produces:

```
ETHERNET = 08-00-2B-26-45-AD
```

When the Ethernet address is not valid, the console program displays the following:

```
ETHERNET = XX-XX-XX-XX-XX-XX
```

3.12.9 SHOW FBOOT

Displays the current diagnostic startup type. The format of this command is as follows:

SH[OW] F[BOOT]

Table 3–8 gives the values and the description of each value.

3.12.10 SHOW HALT

Displays the current status of the halt action flag. The format of this command is as follows:

SH[OW] H[ALT]

Table 3–9 gives the values and the corresponding halt action. The following is an example of the display that this command produces:

```
HALT = 00000002
```

3.12.11 SHOW KBD

This command is not applicable to MicroVAX 3100 systems.

3.12.12 SHOW MEM

Displays information about the memory in the system. The format of this command is as follows:

SH[OW] ME[M]

Figure 3–5 is an example of the display that the SHOW MEM command produces.

Figure 3–5 SHOW MEM Display

```
MEM_TOP = 00800000 ❶
MEM_BOT = 00000000 ❷

    MEM_NOT_AVAIL
------------------
007C3600:007fffff ❸
```

❶ The total amount of memory in the system, including the console data structures.

❷ The first address of a 256K-byte block of contiguous memory, generally used by the VMB.

❸ This line and subsequent lines show the address ranges of the memory areas that are not available to the operating system. These memory areas include the memory area that is reserved for the console program.

3.12.13 SHOW MOP

Displays the status of the network listener flag. The format of this command is as follows:

SH[OW] MO[P]

Table 3–10 gives the values and the meaning of each MOP value. The following is an example of the display that this command produces:

```
UTC      = 00000000E0D8BAE0
AccurTDF = 10000000000186A0
BytesRx  = 0000000000000000
BytesTx  = 0000000000000078
FramesRx = 0000000000000000
FramesTx = 0000000000000002
McBytsRx = 0000000000000000
McFrmsRx = 0000000000000000
FrmDefer = 0000000000000000
Frm1Coll = 0000000000000000
FrmMColl = 0000000000000000
TerXsCol = 0000000000000000
TerCarCk = 0000000000000000
TerShCkt = 0000000000000000
TerOpCkt = 0000000000000000
TerFrLng = 0000000000000000
TerNoDef = 0000000000000000
RerFCSEr = 0000000000000000
RerFrmEr = 0000000000000000
RerFrLng = 0000000000000000
UnknDest = 0000000000000000
DataOvrn = 0000000000000000
SyBuffUn = 0000000000000000
UsBuffUn = 0000000000000000
HrtBtErr = 0000000000000001

MOP = 00000001
```

3.12.14 SHOW PSE

Displays the condition of the console security feature of the system. The format of the command is as follows:

SH[OW] PSE

Table 3–11 gives the values and a description of each value.

3.12.15 SHOW RADIX

Displays the current default radix value. The format of this command is as follows:

SH[OW] R[ADIX]

Table 3–12 shows the values and the meaning of each value.

3.12.16 SHOW SCSI

Displays the current SCSI ID that the firmware assigns to the system's SCSI controller. The format of this command is as follows:

SH[OW] S[CSI]

The normal SCSI ID of the system's SCSI controller is 6 when the system is shipped. The following is an example of the display that this command produces:

```
SCSI = 00000006
```

3.12.17 SHOW TRIG

Displays the status of the remote trigger flag. The format of this command is as follows:

SH[OW] TR[IG]

Table 3–13 gives the values and a description of each value. The following is an example of the display that this command produces:

```
TRIGGER = 00000000
```

3.13 START

Allows you to specify the address from which program execution starts. The format of this command is as follows:

S[TART] <addr>

where:

- *<addr>* is the address from which program execution starts.

You must specify the <addr> parameter.

3.14 TEST

Allows you to invoke the diagnostic tests, extended tests, and utilities. The format of this command is as follows:

T[EST] [/UTIL] <devnam | devnbr>

where:

- */UT[IL]* is a qualifier that invokes a utility
- *<devnam>* is the device name
- *<devnbr>* is the device number

3.15 UNJAM

Provides a system reset. The format of this command is as follows:

U[NJAM]

The firmware returns all the devices to known, initial states. All registers and logic states are set to 0.

3.16 X (transfer)

Note

This command is intended for use by host software that communicates with the system through a console device connected to MMJ port 0 or MMJ port 3. Do not enter this command at the console prompt.

Transfers binary data to and from physical memory. The format of this command is as follows:

X<address><count><CR><checksum><data_stream><checksum>

where:

- *<address>* is the physical address (in hexadecimal format), to which or from which the data is transferred.
- *<count>* is the number of bytes to transfer. It is an 8-bit hexadecimal number. When the high order bit of this parameter is 1, the data is transferred from physical memory to the console device. When the high order bit of this parameter is 0, the data is transferred from the console device to physical memory.
- *<CR>* is a carriage return.
- *<checksum>* is the two's complement of the command string.
- *<data_stream>* is the returned data.
- *<checksum>* is the two's complement of the data stream.

3.17 ! (comment)

Note

You use this command when writing host software that communicates with the system through a console device connected to MMJ port 0 or MMJ port 3.

Prefixes a comment. The format of this command is as follows:

! <comment>

where:

- *<comment>* is the comment text.

You can place the exclamation point (!) anywhere on a command line. The console program ignores all text after an exclamation point (!).

4

Hardware Specifications

This chapter lists the hardware specifications of the following:

- System unit
- Internal SCSI device

4.1 System Unit Specifications

The following tables list the specifications for the Model 40 and Model 80 systems.

Table 4–1 System Specifications: Model 40

Subject	Description
Processor	KA45.
Boot and diagnostic firmware ROM	256K bytes.
Options ROM	32K bytes.
DRAM memory	8M bytes, expandable to 32M bytes. The first 8M bytes are on the system module.
Hard disk	RZ23L, RZ24, or RZ25 (the system supports a maximum of three devices).
Tape drive	TZ30, TZK10.
Diskette drive	RX26.
Compact disc drive	RRD42.
Terminals	Supports the VT™ series.
Interfaces	One SCSI port, one ThinWire Ethernet port[1], one standard Ethernet port[1], three DEC423 MMJ ports, one modem port. Optional: 8 or 16 additional asynchronous DEC423 MMJ ports or 8 additional asynchronous modem ports, 2 additional synchronous ports.
Input voltage	Automatically adjusting ac input. Range: 100 volts (V) ac to 120 V ac or 220 V ac to 240 V ac.
Maximum inrush current	32 Amperes (A).
Maximum running current	1.2 A at 110 V ac, 0.6 A at 220 V ac.
Steady state current	1.0 A at 110 V ac, 0.5 A at 220 V ac.
Maximum power consumption	120 Watts (W).
Frequency	49 hertz (Hz) to 61 Hz.

[1]Both Ethernet types cannot be used simultaneously.

Table 4–2 System Specifications: Model 80

Subject	Description
Processor	KA47.
Boot and diagnostic firmware ROM	256K bytes.
Options ROM	32K bytes.
DRAM memory	8M bytes, expandable to 72M bytes, all on MS44 memory options.
Hard disk	RZ23L, RZ24, or RZ25, (the system supports a maximum of five devices).
Tape drive	TZ30, TZK10.
Diskette drive	RX26.
Compact disc drive	RRD42.
Terminals	Supports the VT series.
Interfaces	One SCSI port, one ThinWire Ethernet port[1], one standard Ethernet port[1], three MMJ ports, one modem port. Optional: 8 or 16 additional asynchronous DEC423 MMJ ports or 8 additional asynchronous modem ports, 2 additional synchronous ports.
Input voltage	Automatically adjusting ac input. Range: 100 V ac to 120 V ac or 220 V ac to 240 V ac.
Maximum inrush current	32 Amperes (A).
Maximum running current	1.2 A at 110 V ac, 0.6 A at 220 V ac.
Steady state current	1.0 A at 110 V ac, 0.5 A at 220 V ac.
Maximum power consumption	120 Watts (W).
Frequency	49 Hz to 61 Hz.

[1]Both Ethernet types cannot be used simultaneously.

Table 4–3 System Unit Metrics

System Unit	Weight[1] kg (lb)	Height cm (in)	Width cm (in)	Depth cm (in)
Model 40	15.5 (34)	14.99 (5.90)	46.38 (18.26)	40.00 (15.75)
Model 80	15.5 (34)	14.99 (5.90)	46.38 (18.26)	40.00 (15.75)

[1]Depends on configuration

Table 4–4 System Storage Conditions

Storage Condition	Range or Value
Temperature range	5°C to 50°C (41°F to 122°F)
Relative humidity	10% to 95% at 66°C (noncondensing)
Altitude	0 m to 2400 m (0 ft to 8000 ft)
Maximum wet bulb temperature	32°C (90°F)
Minimum dew point	2°C (36°F)

Table 4–5 System Operating Conditions and Nonoperating Conditions

Operating Conditions	Range or Value
Temperature range	10°C (50°F) to 32°C (90°F) with TZ30 tape drive; otherwise 10°C (50°F) to 40°C (104°F)
Temperature change rate	11°C (20°F) per hour maximum
Relative humidity	10% to 90% noncondensing
Maximum wet bulb temperature	28°C (82°F)
Minimum dew point	2°C (36°F)
Altitude	2400 m (8000 ft) at 36°C (96°F)

(continued on next page)

Table 4–5 (Cont.) System Operating Conditions and Nonoperating Conditions

Nonoperating Conditions	
Temperature range	–40°C (–40°F) to 66°C (151°F)
Relative humidity	10% to 95% at 66°C (151°F)
Altitude	4900 m (16 000 ft)
Maximum wet bulb temperature	28°C (82°F)
Minimum dew point	2°C (36°F)

4.2 Internal SCSI Device Specifications

Digital's hardware and software are fully compatible with the SCSI-1 specifications and adhere to all the mandatory features of revision 10d of the ANSI SCSI-2 specification draft.

The following tables list the specifications for the internal SCSI devices.

Table 4–6 RZ23L, RZ24, and RZ25 Hard Disk Drive Specifications

Formatted Storage Capacity	RZ23L	RZ24	RZ25
Per drive (M bytes)	121	209	426
Blocks per track	39	38	48 to 74
Blocks per drive	237 588	409 792	832 031
Buffer size (K bytes)	64	64	60
Performance	**RZ23L**	**RZ24**	**RZ25**
Transfer rate to or from media (M bytes/second)	1.5	1.5	2.1 to 3.2
Data transfer rate (M bytes/second)	1.13	1.13	2.33
Transfer rate to or from buffer, asynchronous (M bytes/second)	3	3	3
Transfer rate to or from buffer, synchronous (M bytes/second)	4	4	4
Average seek time (milliseconds)	$\leq$ 19	16	14
Maximum seek time, full stroke (milliseconds)	$\leq$ 35	$\leq$ 35	28
Average latency (milliseconds)	8.8	8.6	6.8
Average access (milliseconds)	26.8	24.6	20.8

(continued on next page)

Table 4–6 (Cont.) RZ23L, RZ24, and RZ25 Hard Disk Drive Specifications

Functional Specifications	RZ23L	RZ24	RZ25
Recording density (bits/inch)	36 250	31 800	38 834
Track density (tracks per inch)	1850	1700	1760
Area density (M bytes per square inch)	67.06	54.06	68.28
Read/write heads	4	8	9
Disks	2	4	5
Recording mode	CF[1]	CF	ZBR[2]

Power	RZ23L	RZ24	RZ25
Maximum seeking (W)	3.8	6.6	14
Typical seeking (W)	3.6	6.6	10
Maximum starting (W)	14.5	27.5	34.5

[1]Continuous frequency

[2]Zone bit recording

Table 4–7 TZ30 Tape Drive Specifications

Subject	Description
Mode of operation	Streaming
Media	12.77 mm (0.5 in) unformatted magnetic tape
Bit density	2624 bits/cm (6667 bits/in)
Number of tracks	22
Transfer rate (at host)	62.5K bits/s
Tape speed	190 cm/s (75 in/s)
Track format	Multiple track serpentine recording
Cartridge capacity	95M bytes, formatted (approx)

Table 4–8 TZK10 QIC Tape Drive Specifications

Subject	Description
Mode of operation	Streaming.
Media	DC6320, DC6525, or Digital approved equivalent. See the *MicroVAX 3100 Model 40 and Model 80 Operator Information* manual.
Track width: write	0.1778 mm +0.0000, -0.0127 mm (0.0070 in +0.0000, -0.0005 in).
Track width: read	0.1270 mm +0.0127, -0.0000 mm (0.0050 in +0.0005, -0.0000 in).
Bit density	16K bits/in.
Number of tracks	26.
Transfer rate	200K bytes/s at average streaming mode, 1.5M bytes /s at SCSI maximum.
Tape speed	305 cm/s (120 in/s).
Track format	Multiple track serpentine recording.
Cartridge capacity	320M or 525M bytes, formatted (approx), depending on the QIC tape used.

Table 4–9 RX26 Diskette Drive Specifications

Subject	Description
Diskette size	9 cm (3.5 in)
Diskettes per diskette drive	1
Number of read/write heads	2
Data capacity (formatted)	1.44M bytes—high density (HD) diskettes
	2.88M bytes—extra density (ED) diskettes
Number of bytes per sector	512
Number of sectors per track	18 (HD diskettes)
	36 (ED diskettes)
Number of cylinders	80
Number of tracks per cylinder	2
Transfer rate	500K bits/s (HD diskettes)
	1M bits/s (ED diskettes)

Table 4–10 RRD42 Compact Disc Drive Specifications

Subject	Description
Acceptable discs	CDROM mode-1 data discs
	CDROM mode-2 data discs
Disc capacity	600M bytes
Rotation speed: innermost track	530 r/min at CLV = 1.4 m/s
Rotation speed: outermost track	200 r/min at CLV = 1.2 m/s
Sustained data transfer rate	150K bytes/s
Burst data transfer rate	1.5M bytes/s
Access time: full stroke	650 ms
Access time: average	380 ms

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